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ABSTRACT

This brief information guide presents a model for developing a global classroom using computer-based technologies. The first chapter provides a working definition of global education and the reasons it is needed. Global networks enable students at all grade levels to acquire the knowledge and develop the skills to understand and guide their world. The next two chapters describe the computer-based technologies that can connect the classroom to the global community, as well as strategies for implementing these technologies. The final chapter discusses the impact that computers and global education will have on the curriculum, students, and society in general. A resource section lists 14 computer networks and organizations involved in global education for readers interested in learning more about the field. (Contains 5 references.) (SLD)

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FASTBACK

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Using Computer Technology to Create a Global Classroom

Dan H. Wishnietsky

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EDUCATIONAL FOUNDATION

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DAN H. WISHNIETSKY

Dan H. Wishnietsky is an associate professor of mathematics and director of the Academic Computer Center at Winston-Salem State University in Winston-Salem, North Carolina. He has taught at the high school, community college, and university levels.

Wishnietsky holds degrees in engineering, psychology, education administration, and sociology from the University of California-Los Angeles and the University of North Carolina-Greensboro. He is a member of the National Council of Teachers of Mathematics and Phi Delta Kappa.

His publications include articles on teacher burnout, sexual harassment, hospital patient education, and mathematical metaphors for philosophical structure. This is his third fastback on the use of computer technology in education. His earlier fastbacks are 316 *Using Electronic Mail in an Educational Setting* (1991) and 339 *Hypermedia: The Integrated Learning Environment* (1992).

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Using Computer Technology to Create a Global Classroom

by
Dan H. Wishnietsky

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Introduction

When well-known Canadian educator and futurist Marshall McLuhan formulated the concept of a "global village" in the 1960s, most people believed it to be pure fantasy. Events of the time included the construction of the Berlin Wall, the Bay of Pigs invasion in Cuba, the civil rights movement, the Vietnam War, and continuing conflicts between Israel and Arab nations. The Cold War was at its peak, and global conflict seemed far more likely than a global village.

World events have changed as we approach the 21st century, and evidence of "globalization" and a "global economy" is everywhere. Advances in technology enable us to have almost instantaneous exchange of ideas, services, and information worldwide. Any person with a radio or television can receive news about politics, the arts, sciences, sports, and medicine as it is developing anywhere in the world. People with a computer and modem not only receive this information, they can respond to it.

In business and industry, national boundaries are vanishing; and the world is becoming an interconnected marketplace. The United States has ceased to be the dominant economic power and is now more a partner in the international marketplace. Competition for consumer goods, technology, energy, and labor are having a direct impact on the health of the U.S. economy. Foreign companies are investing in U.S. corporations. U.S. companies are using imported parts for their products but also are moving plants to countries with cheaper labor.

Japanese and American companies have entered into new partnerships to produce automobiles and other consumer products.

Almost every aspect of life now has universal context. Crime, disease, and the environment, which once were considered local concerns, now are matters of global significance. Solving problems such as drug trafficking, AIDS, and global warming will require worldwide cooperation and shared responsibility. Worldwide emigration has produced a more multiethnic and multicultural population, especially in the United States – both in the schools and the work place.

As new international realities displace traditional notions about geography, politics, and economics, educators must respond with global education for students at all levels. And communications technology will play an increasingly significant role in delivering global education to our schools.

This fastback presents a model for developing a global classroom using computer-based technologies. The first chapter provides a working definition of global education and the reasons why it is needed. The next two chapters describe the computer-based technologies that can connect the classroom to the global community, as well as strategies for implementing these technologies. The final chapter discusses the impact that computers and global education will have on the curriculum, students, and society in general. The resource section lists computer networks and organizations involved in global education for readers interested in learning more about the field.

The Need for Global Education

The curriculum in most U.S. schools remains nationalistic, provincial, and ethnocentric. Few U.S. students develop fluency in a foreign language compared to their European peers, many of whom are multilingual. Many American students have difficulty locating continents on a globe, let alone the countries on the continents. And knowledge of foreign cultures is sparse. Instead of presenting an accurate and up-to-date view of an interconnected planet, the curriculum too often presents a picture of a world that no longer exists.

The United States no longer can remain detached from events happening in other parts of the world. The political, social, cultural, and economic changes occurring throughout the world demand a curriculum that offers a global perspective in all subjects and at all levels.

Defining Global Education

Robert G. Hanvey (1976) offers a definition of global education that is helpful for the discussion that follows:

> Global education is learning about those issues that cut across national boundaries and about the interconnectedness of systems, ecological, cultural, economic, political, and technological. Global education involves perspective taking, seeing things through the eyes, minds, and hearts of others; and it means the realization that while individuals and groups may view life differently, they also have common needs and wants.

Hanvey's definition implies more than adding a civics class, a foreign language class, or a social studies unit on international relations. The total curriculum should be infused with a global outlook, exposing students to the literature, art, music, and other features of different cultures. An example of this infusion is the North Dade Center for Modern Languages in Miami, Florida, an international studies magnet school, where the mission is to provide a curriculum that is fully multicultural. The school uses the resources of the Global Studies program at Florida International University for teacher training and curriculum development. The Cuban, African, Jewish, and South American cultures located in the Miami area provide teachers and students with valuable multicultural experiences. North Dade Center students have access to computers connected to a global online education network, which enables them to engage in interactive exchanges with students throughout the world.

There are some who express concern that global education will diminish patriotism and undermine national values. Such concerns are unwarranted. Developing understanding of and tolerance for others does not cause one to reject one's country. The intent of global education is not rejection of national beliefs or doctrine but understanding the beliefs of others. Global education provides a framework wherein students learn about themselves and others so they can be successful participants in our interconnected world.

Basic Principles of Global Education

In 1990, the Global/International Education Commission of the Association for Supervision and Curriculum Development (ASCD) presented its global curriculum principles and model curricula. The principles are:

- All teachers, as well as students, should have opportunities to learn about and work with individuals whose ethnic and cultural backgrounds are different from their own.

- International/global studies should be viewed as cross-disciplinary, involving the arts, humanities, sciences, and mathematics, as well as foreign languages and social studies.
- The impact on individuals and on society of the increase in transnational interactions should be included in the curriculum, reflecting interdependence with other nations and the role of the United States in the global economy.
- The changing role of nations in the world system should be explained throughout the instructional materials, and the increasing number and importance of international organizations should be highlighted wherever appropriate.
- The changing and evolving role of the United States in world affairs should be included in the study of international trends and developments.

An example of the ASCD global curriculum principles in action is the program at the Global Studies Year-Round Magnet School in Greensboro, North Carolina. This school has implemented a program that provides students with an understanding and respect for the world's peoples and cultures and stresses interdependence and complexity. The base program is the K-6 geography sequence published by the Geographic Education National Implementation Project (GENIP).

All subjects reflect a global theme. The language arts curriculum has a global emphasis and uses an integrated communications model for teaching reading, writing, speaking, and listening. Reading is literature-based and uses books that feature multicultural themes, folk literature, and global issues. A second language is required of all students and is taught using the Foreign Language in the Elementary School (FLES) approach. The students study music and art from around the world and participate in art exchange programs with students from other countries. Even the school lunch room has a global emphasis, with food from a different country featured each month.

This school also incorporates computer-based global networks into the curriculum. Teachers and students communicate with their peers

from across the country and around the world and participate in interactive learning activities provided on the network. They also have access to data on CD-ROM, such as a multimedia encyclopedia and world atlas. Students have access to this technology through a computer lab; also, there are computers in every classroom and a fully automated media center.

Objectives of Global Education

A primary objective of global education is to prepare students for productive citizenship in the emerging global environment. In his classic satirical work, *The Saber-Tooth Curriculum* (1939), Harold Benjamin, the first director of International Education Relations in the United States Office of Education, tells us about New-Fist, the designer of the first curriculum. His curriculum included grabbing fish and clubbing woolly horses for food and scaring saber-tooth tigers for protection. New-Fist's students who were educated in these subjects clearly had an advantage over those who were unschooled.

As time passed, the world changed. With the approaching ice age, the streams became murky and it was impossible to see the fish for fish grabbing; the woolly horses departed to warmer climates; and the saber-tooth tigers died. Thus the school curriculum became outdated and needed modification. Some education reformers suggested new subjects for meeting the needs of their changing world. These included making nets for catching fish in muddy streams, constructing snares for catching antelope, and digging pits on bear trails for protection from the glacial bears, which arrived with the ice sheet. These activities required new knowledge and skills in order for people to survive. Unfortunately, the original curriculum was firmly entrenched and the school day was too crowded to introduce the new subjects.

As New-Fist's curriculum needed to be changed to reflect a changing world, so the curriculum in today's schools must reflect current and future realities. To prepare students for our interconnected world, schools must have a curriculum that is extensive and international,

one that is open to new thoughts and ideas. Instead of focusing on numerous facts, global education emphasizes the thinking skills needed for solving global problems and adjusting to new circumstances. The survival of New-Fist's people depended on teaching them new content that reflected current and future realities. Today's teachers and curriculum developers face the same challenge of providing students with knowledge about the current global environment so that they can become productive citizens of their world.

To incorporate global education into the curriculum will require extensive training in global studies, teaching strategies, and the use of new technologies. Such training is available from universities and professional organizations and from schools that already have implemented global education.

Another objective of global education is to prepare students to understand, respect, and work with people from cultures other than their own. (See fastback 361 *Integrating the Trans-National/Cultural Dimension* by Seymour Fersh.) One effort in achieving this objective is the recommendation of the National Commission on Social Studies in the Schools, which advocates that the teaching of U.S. history be combined with world history in order to provide an international context for understanding U.S history. As students come to understand the international influences on the development of their own country, they will have increased respect for other cultures.

Likewise, the language arts have rich potential for increasing global awareness and understanding of other cultures. Instead of reading ethnocentric basal readers, children can read and discuss literature from many cultures. One organization that provides literature written by authors from around the globe is Short Story International. It distributes a reading series for ages 10 and higher containing quality short stories by living authors, who offer different cultural perspectives.

Student exchange programs also contribute to an increased awareness of other cultures. Such programs offer many occasions for sharing in formal and informal settings. Students who have participated

in foreign exchange programs report that they were profoundly influenced by the experience. In a recent survey of several hundred foreign exchange students, Siegfried Ramler (1988), chair of the ASCD Commission for Global/International Education, reported that a high percentage of these students specialized in international studies and chose careers with international interests. Ramler also notes that the number of careers that require international interests will increase and that students need to begin now to prepare for them.

A third objective of global education is involving students with current global problems, such as conserving the world's natural resources. For example, students might plan and implement recycling projects, prepare reports on their projects, and discuss how recycling benefits the global environment. Local projects such as these carry over to conservation efforts on a global scale and help instill in students a responsibility for our planet.

Students who experience a curriculum with a global perspective will be prepared to live and work in our interconnected world. They will be able to integrate their national history with world history, thus giving the study of history a global perspective. They will learn to understand and respect people from other cultures and will develop loyalty to the interests of their planet, as well as to the interests of their own nation. They will be able to live and work with people throughout the world, bringing new perspectives as they explore new choices and possibilities.

Using Technology to Make Global Connections

Teachers have developed many strategies for creating global classrooms, including using multicultural texts, incorporating literature from around the world, and exposing students to the arts of many cultures. A strategy with great potential for creating a truly global classroom is using the new telecommunication technologies to connect classrooms into a worldwide communications network. Using a computer, a modem, and word-processing software, teachers can bring the world into the classroom.

Classroom projects using telecommunication technology are sponsored by such organizations as Global Learning Corporation, AT&T, and the National Geographic Society. These projects give students the opportunity to interact and collaborate with other students throughout the world. These organizations have developed learning options that can become an integral part of the curriculum, options that are responsive to world events almost as they are happening. Students work on projects individually or in groups and then share their ideas and solutions with other students on the network. Each project uses current data that applies to a real-world issue.

Hardware and Software Requirements

Connecting to a global education network requires a computer, modem, dedicated phone line, and appropriate telecommunication soft-

ware. The computers used with these networks are already in place in many schools. These include the Apple IIe (Enhanced), IIc, and IIGS, all with a minimum of 128K memory; the Macintosh series with a minimum of 512K memory; and any MS-DOS-compatible PC with a minimum of 256K memory. When communicating with a global network, computers with two disk drives will suffice for storing software and messages; however, a hard drive is strongly recommended. A hard drive reduces the need for floppy disks and the problems associated with them.

Although not required for global networks, many teachers have computers with CD-ROM readers as part of their global classroom. This enables students to access such CD-ROM databases as almanacs, encyclopedias, and atlases. For example, students in a Nebraska classroom who are planning to network with students in Lithuania can access the atlas, almanac, and encyclopedia databases to locate Lithuania and learn basic information about the country before going on line to communicate with the Lithuanian students. If the computer has a color monitor and a minimum of two megabytes of RAM, a full-color map of Lithuania can be displayed on the computer screen. All information from the CD-ROM databases can be printed out, thus providing students with a hard copy of the information.

A modem is the device that links the computer to a regular telephone line. The modem enables the computer to send information through phone lines by converting the digital signals of the computer to the analog signals of phone lines. For receiving information, the modem reverses the process by converting the analog signals from the phone lines into the digital signals understood by the computer. The former process is called modulation and the latter demodulation, hence the word modem.

Any Hayes-compatible modem that transmits information at 1200 or 2400 bits per second (bps) will connect the computer to the global network through the phone line. (Modem vendors describe modem speed with the term *baud*. As used by these vendors, the baud rate

is essentially equal to bits per second. Because modem manufacturers have discovered ways to fit more information into signals without increasing the baud rate, it is more accurate to denote speed in bits per second.) As of this writing, online computer networks and information services are beginning to offer lines that transmit and receive signals at 9600 bps. When buying a modem, consider one that offers 9600 bps in addition to 1200 bps and 2400 bps. The extra cost is minimal, and the modem will remain current longer.

In addition to accessing global educational networks, modems enable access to such online information services as CompuServe and Prodigy, computer-based bulletin boards, and electronic mail networks. The information services provide students with instant access to international news, online encyclopedias, and discussion forums with a global or multicultural emphasis. By using the service's index, students are even able to obtain news stories from specific countries.

Bulletin boards give students the opportunity to read and exchange ideas and information, which can be read by anyone on the network. Many bulletin boards focus on topics of global significance and can be easily incorporated into the global classroom. Most bulletin boards require contributors to sign their messages with their computer network address. Students, using the electronic mail application, can then respond to the messages from anyone communicating on the bulletin board. These communications often develop into international electronic mail friendships.

In addition to hardware, telecommunication requires communication and application software. Membership in a global network or online information service often includes the required software. These applications are usually menu-driven and are easy to learn to use. Many modem kits include communication software; and integrated software packages, such as Microsoft Works and ClarisWorks, include a telecommunication component. Another source of telecommunication software is shareware and freeware disks. Before using any freeware or shareware, be certain it is virus free.

Costs and Funding Sources

Because school budgets are limited, funds available for computer technology for the global classroom must be spent wisely. Beyond the basic costs of the computer and modem, additional costs include the charges for installing a dedicated phone line, time charges for use of the phone line, subscriptions to networks, and the cost to maintain, repair, and replace equipment. Even with these expenses, accessing global networks can be cost effective if used properly.

It is essential to have a plan in place detailing how a global network will be used and how it will enhance the curriculum. Global education should not be an instructional postscript but an integral part of the curriculum. The plan should consider such matters as what existing hardware can be incorporated, what additional hardware must be purchased, installation of phone lines, scheduling of computers for student use, and which global networks will best serve students' needs. Having a plan in place will lessen the chances of making costly mistakes that have to be corrected later.

Most computers currently used in schools are compatible with most global networks. The only additional hardware required is a modem. The minimum cost of a 2400 bps modem is between $75 and $100; the cost of 9600 bps modems begins at approximately $160. If the computer does not already have a modem port, there will be an additional expense for buying and installing a communication card for connecting the modem to the computer's microprocessor. However, most computers purchased in the 1990s include a modem port.

Installing a dedicated phone line will be an extra expense, since few schools have phone jacks or phone lines in individual classrooms. Installing phone jacks costs about $50 or more per jack, and installing a dedicated phone line costs about $100. After the initial installation charges, the fee for each line can range from $15 to $50 per month, depending on the school's location and the online time the school uses. To save money, most schools install only one dedicated phone line, which is connected to several phone jacks. The teachers

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then schedule the times each class can access the phone line. With careful scheduling, all students can have access to the global network with only one dedicated phone line.

The cost for subscribing to global networks is reasonable and usually includes everything the school needs. For less than $1,000 per school per year, students and teachers obtain curriculum materials, communication software, training, online practice time, access to all online activities, and electronic mail access to all network subscribers. The larger networks also provide technical support through a toll-free number. Although some global networks have separate charges for each of their services, the total cost per school will be less than $1,000 per academic year.

Optional computer hardware for a global classroom includes a CD-ROM reader and printer. Packages are available for under $800 that include a CD-ROM drive, cables, speakers, and CD-ROM titles, such as an encyclopedia, world atlas, almanac, and reference library. Before buying one of these packages, be certain the school's computers are compatible with the CD-ROM drive. Computers with the technical requirements for CD-ROM – at least two megabytes of RAM and a color monitor displaying 256 colors – can be purchased for under $1,500.

If a school has a dot matrix printer, it may wish to upgrade to a better-quality printer when using CD-ROM applications. For example, when printing a map from a CD-ROM atlas, a better-quality printer produces crisp, clear lines required for maps. For between $300 and $450, a school can purchase an ink jet printer, which produces the clean lines, smooth curves, and clear type needed for high-quality maps. For even higher-quality printouts, a school can purchase a laser printer for approximately $900; a color laser printer sells for about $1,100. Remember, though, CD-ROM readers and high-quality printers are optional; they are nice to have but are not required for accessing global networks.

In this period of limited funding, monies for implementing global classrooms may not be available from the general school budget. How-

ever, there are other sources to be tapped. Schools should consider submitting grant proposals to appropriate federal and state agencies, as well as foundation and corporate sources. Chapter 2 funds from the U.S. Department of Education are available for innovative school projects that improve academics. FIRST (Fund for the Improvement and Reform of Schools and Teaching) and FIE (Fund for Innovation in Education) are other federal funding sources. They provide monies to implement projects involving education technology, instructional media, and innovative educational approaches. Usually a school district's central office has information about how to submit proposals to these and other federal, state, foundation, corporate, and local funding sources. Even if the award is small, every dollar helps.

Computer-Based Global Networks

This section contains brief descriptions of the major online global education networks. To obtain more information, contact the network directly at the address or phone number listed in the Resources at the end of this fastback. The network will send a complimentary information packet giving a detailed account of the network's services, how to subscribe, and current costs.

AT&T Learning Network. This is part of AT&T's EasyLink Services, which connect teachers and students in elementary and secondary schools. The Learning Network links seven to nine classrooms in different locations into a Learning Circle. These Learning Circles operate for six, eleven, or fifteen weeks. Those forming a Learning Circle attempt to achieve geographic and cultural diversity, including international participation.

The AT&T Learning Network offers seven Learning Circle curriculum themes or topics: "Classroom Connections," "Mind Works," "Computer Chronicles," "Places and Perspectives," "Energy and the Environment," "Society's Problems," and "Global Issues." The "Places and Perspectives" curriculum is available in Spanish, French, and German. Each Learning Circle has a corresponding curriculum

designed for different grade levels. Students in the Learning Circle investigate the same topic and communicate on toll-free lines via the AT&T Mail Network electronic mail system. They present ideas, develop solutions to problems, question beliefs, and challenge stereotypes. The classes then work as a group to summarize, edit, and evaluate the ideas presented and then produce a final Learning Circle publication.

WorldClassroom Network. This is the online global education network of the Global Learning Corporation. With WorldClassroom, students and teachers from around the globe work together on different projects. Participants receive lesson plans, access real data, communicate with peers around the world, and participate in individual and group writing activities. The current curriculum includes science, social studies, and language arts. In addition to the core curriculum, the network provides discussions with guest speakers and multilingual student exchanges in many languages.

The WorldClassroom is introduced with a "Welcome Conference," in which a personal host takes new subscribers on a guided tour of the network. Teachers receive an overview of the course offerings and a schedule of guest speakers and professional discussion sessions. They are then able to select courses from an extensive menu that will enhance their teaching and supplement their curriculum. Classes may work independently or in a "cluster group" of six to eight classes. As students use the network and communicate with their peers from around the world, they develop a greater understanding of each other and a global perspective for world issues.

Global Common Classroom. This network, sponsored by the Program in Social Ecology at the University of California, Irvine, is a collaboration between the university, the National Geographic Society, the International Foundation for the Survival and Development of Humanity, the Russian Academy of Sciences, and the Moscow-based, non-governmental Institute for New Technologies. The purpose of this network is to link U.S. schools to schools in other nations. Its

major goals are to maintain and enhance existing classroom collaborations between schools in Russia and the United States and to initiate new arrangements with schools and universities in Poland, Czechoslovakia, Rumania, Bulgaria, Hungary, and the Spanish-speaking countries of North, Central, and South America. To participate in the Global Common Classroom, a school must be a subscriber to the Kids Network.

Kids Network. Sponsored by the National Geographic Society, this is a worldwide computer-based network that enables elementary school students to participate in science and geography projects. The students collect data locally and then share their information with other schools via the network. Topics covered include acid rain, water pollution, recycling, weather, solar energy, and nutrition. During the school year, there are five 8-week sessions. Participants receive communication software, a teacher's guide, activity sheets, student handbooks, and other related materials.

FrEdMail. This is a worldwide network of independent computers that operates as an electronic bulletin board within a school or school district. During the hours when telecommunication costs are low, FrEdMail delivers messages throughout the world. It publishes a newsletter containing project ideas to use on the network. Most of the projects are designed to encourage student writing, and they have included an international cookbook and a multinational consumer product guide. Except for the cost of calling the nearest FrEdMail computer, FrEdMail is free.

TERC Global Laboratory. Funded by the National Science Foundation, this network connects teachers, students, and research scientists in the investigation of ecological problems. In addition to providing curriculum units with suggested projects, TERC Communications furnishes reasonably priced instruments for collecting and recording data. More than 60 schools worldwide currently are conducting research on the TERC network about ozone levels, acid rain and snow, water pollution, and radiation levels.

Internet. This is largest and most-used global computer network for student and faculty exchange, research, and collaboration. Sometimes called the "network of networks," Internet includes the computer networks of the National Science Foundation, the National Aeronautics and Space Administration, the Department of Energy, European international networks, and many others. This vast computer network links more than 5,000 smaller networks in more than two dozen countries and is used by nearly four million scholars, students, and administrators.

The major advantages of Internet are its speed and the availability of resources. By having a standard communication protocol, the Transmission Control Protocol/Internet Protocol (TCP/IP), computers on the different Internet networks can transmit and receive vast amounts of information at nearly the speed of light from any other computer on the network. This enables educators to collaborate with their peers across the world as easily as if they were down the hall. In addition to electronic mail and public bulletin boards, users of Internet have electronic meetings to discuss topics of common interest. Users also can subscribe to a topic mailing list. They receive information regarding the topic and can respond by sending replies to all other list members. It is not unusual to communicate with a famous author or Nobel laureate.

Other applications available on Internet include the card catalogs of libraries from around the world, journal indices, abstracts of articles, and the previously mentioned WorldClassroom. Educators who access WorldClassroom via Internet receive a lower online rate. Internet's resources are so abundant that it has been compared to a television with a million channels. Whatever resource is requested seems to be there, and it still is expanding. Internet's successor, the National Research and Education Network, is being developed. Future plans include simplified commands for accessing the many network applications, the transmission of sound and moving pictures, and the full text of books and journals.

Teleclass International. This global classroom network goes beyond electronic mail and links students around the world using computers and video telephones. Participating schools must purchase a video telephone for transmitting still images. The least expensive of these phones costs about $300. The only other cost for this network is the long-distance calls to other countries. Classroom projects on the Teleclass network have included discussions between American and Spanish students about U.S. military bases in Spain and discussions between Japanese and U.S. students on Japanese history.

There are many other global education communication networks sponsored by different universities and companies. Information about these networks can be obtained from the Association for Supervision and Curriculum Development's *Global Connection*. While the various networks have their similarities and differences, each strives to develop global awareness in students so that they can participate fully in their interconnected world.

The Global Classroom

Implementing global education entails more than purchasing a computer and modem and subscribing to a global network. Telecommunication is effective only when it is an integral part of a global learning environment. Teachers must be advocates of global awareness and encourage their students to learn about and work with people of different ethnic and cultural backgrounds. Telecommunication makes this possible, because students are able to communicate and work with people representing different cultures and viewpoints from around the world.

Training and Planning

Creating the global classroom using telecommunication will require considerable planning and staff training. The first step is for teachers to become globally aware and familiar with global awareness teaching strategies. This will prepare them to evaluate the different global networks and decide which ones align best with their curriculum and meet students' needs. Many schools begin with a planning committee to survey their existing technology and to identify what additional technology is needed and its cost. One or more persons from the school who are familiar with the technology should be on the planning committee. These individuals should be willing to help train other teachers and be resource persons.

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Once decisions about hardware are made, the planning committee must decide which global network is best for the school. Committee members should have information from each of the networks being considered. This information is available by writing or calling the individual networks. It is also helpful to have evaluations of the networks that have been published in professional journals and other unbiased sources.

In selecting a network, the committee should consider such items as the curriculum area to be emphasized, the grade level of network projects, the length of the projects, the availability of technical support, and the cost. For example, the AT&T Learning Network offers elementary, middle, and high school programs in six curriculum areas. Seven to nine classrooms that share a curriculum interest communicate and decide on a project. The WorldClassroom global network is more structured. Participants receive detailed lesson plans, authentic data, and topics for planning and discussion.

Another factor is the cost of online access time. The Learning Network provides unlimited toll-free computer communications for all U.S. participants, while WorldClassroom charges $18 per hour. However, WorldClassroom costs about $200 less per school year than the Learning Network when excluding online costs.

Through careful appraisal of the various factors, the planning committee can select a global network that brings the world into the classroom and integrates best with the existing curriculum. The choice of a global network does not have to be permanent. Subscription terms vary in length from two to nine months, depending on the network and payment option. If evaluation reveals that the chosen network is not appropriate, another choice can be made.

The next step is a training program for using the global network. Teachers will need specific instruction in how to use the modem, how to access the communication software, and how to connect to the network. Once connected to the network, teachers must learn how to send electronic mail, read and save online information, and send

projects to the network. Teachers should practice using the global network service before trying to teach the operations to their students. The major global networks send training diskettes and documentation to new subscribers. Some even include online orientation sessions in the subscription price in order to give teachers an overview of the system.

In addition to the mechanics of using a global network, teachers must become familiar with its curriculum and special features. Each network provides a schedule of curriculum options, special activities, and online conferences for the school year. This information enables teachers to select projects that are most suitable for their curriculum, students' needs, classroom schedules, teaching style, and budget. Teachers who have incorporated online global education networks into their classroom report positive results. They point out that their students better understand life in other cultures because of the real-world, interactive learning experiences provided by the network.

Global Classroom Projects

The major purpose of global education networks is to enable students to share perspectives, ideas, and projects with other students from around the world. During the first two or three sessions using the computer, students learn how to access the global network and communicate with other participants. They then choose a project in collaboration with several other classrooms and form a global learning team. The teams share their ideas and information, assign tasks for each individual class, and produce a finished product.

A popular network project is to publish a bilingual newspaper. In one project, three Spanish classes at different schools in the United States formed a network cluster with students studying English in Spanish-speaking countries. The students wrote, edited, and shared articles using the global network. The articles covered a variety of topics: local places of interest, favorite foods, local festivals, weather patterns, and local politics. Students from each class wrote arti-

cles in both their first and second languages. In a short time, they became more aware of their cultural differences and similarities from reading the shared articles. The final step was to edit and publish copies of the newspaper. These were then shared with each of the schools on the network and their surrounding communities.

Many teachers tailor the network-generated newspapers or journals to the requirements of their class. For example, social studies classes have published journals about social problems. Topics included problems relating to crime, the homeless, welfare, immigration, ethnic groups, and AIDS. Students from the different countries in the network who shared their ideas and beliefs developed a deeper understanding of the problems and together developed strategies for solving these problems. The project also improved research and language skills. Students researched, drafted, and edited the messages to be sent on the network. Later they evaluated the messages to see which would be published.

One of the more entertaining social studies projects involved elementary school students in Egypt, South America, and the United States. Their task was to publish a paper that reported the way Thanksgiving was celebrated in their communities. In the articles written by the Egyptian students, they told how the ancient Egyptians celebrated Thanksgiving in honor of Min, the god of vegetation. There was a parade with a white bull, followed by a statue of Min, and then a priest carrying a basket of lettuce. The South American students reported that Thanksgiving for the ancient Mayan and Aztec peoples was a celebration for a successful corn crop. In those times, one of the ceremonies involved a slave girl dressed as a goddess, who would dance for a week before being killed. The U.S. students wrote about the Pilgrims' Thanksgiving and told the South American students that the North American Indians also celebrated a Thanksgiving for the corn crop. The students noted that their countries celebrated Thanksgiving differently; but in each case, the celebration was for a bountiful harvest.

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Similar global network projects have been designed by teachers in many curriculum areas. (See fastback 335 *Using Telecommunications in Teaching Middle School Reading*, by Rosemary Lee Potter.) Students in language and creative writing classes have shared essays, fables, poetry, and short stories they have written. Their writings from around the globe could be read on a computer bulletin board or printed and posted in the classrooms. Geography classes were able to learn about the culture, government, and geography of a region from people who live there. Projects have included developing a world almanac, travel guide, and city atlas. In science classes, students exchanged information and data about the environment, weather, ecology, and other topics with their peers on a worldwide basis. Many of the projects integrated mathematics with the sciences and provided valuable data to the research community.

Students also collaborate with the research community via computer networks by providing data for current research projects. For example, students at Montgomery Blair High School in Silver Spring, Maryland, communicate with university faculty, use university library sources, and participate in research projects through computer networks. In one project, a student at this high school read some articles by a Yale professor as part of her research. She sent a message to him through the computer network and became involved with one of his research projects.

Montgomery Blair High School is but one of the growing number of schools that cooperate with universities to offer their students expanded learning opportunities. Another example: Third-grade students in Glendora, California, communicated with peers in Zimbabwe through a computer network at California State Polytechnic University at Pomona. In Florida, a computer network called Learning Link connects students and teachers. Students create learning forums on the network, and teachers can research current curriculum innovations. Global links on the network even have included communication between students and explorers at the South Pole.

Some of the more stimulating projects occurred when students debated controversial issues. Using a global network, students in the United States, Germany, and other countries were able to discuss German unification as it was occurring. Other topics included discussions regarding the Middle East, free trade, and other aspects of U.S. foreign and domestic policy. Many U.S. students, and even their teachers, often are surprised to learn how people in foreign countries feel about actions taken by the United States. This is not only eye-opening, it also helps the students better understand each other.

Sometimes world events provide history-making moments for the subscribers of global networks. During the attempted coup in the former Soviet Union in August 1991, Moscow television was showing *Swan Lake* ballet and old movies. But Soviet educators were sending messages on the WorldClassroom global network asking for information about the events happening around them. Network subscribers from North America and Europe were able to respond by sending news reports into Russia. These subscribers received from Russian teachers and students firsthand reports about standing overnight with the crowd defending the Russian White House. The messages expressed fear of what the Soviet soldiers might do but also captured the excitement of victory and the beginning of change in their country.

Sometimes excitement is generated because of a natural event related to a global network classroom project. Students from a school in Rhode Island spent weeks analyzing current earthquake data from the National Earthquake Data Center in Denver. The analysis predicted a major earthquake in the San Francisco area. A week after the students made their prediction, it was fulfilled; San Francisco experienced a catastrophic earthquake. The students were in shock. Should they have called and warned someone? Was this just a coincidence or a valid prediction based on actual data?

Other global network opportunities have included guest speakers and professional discussions. Teachers were able to develop new instructional techniques by sharing ideas with colleagues from around

the globe. Telecommunication can provide teachers with instant access to each other, enabling them to exchange ideas, comments, and critiques. Through guest speakers, global networks can offer subscribers direct access to people who are highly knowledgeable in different areas. Guest speakers have included government officials from several countries, military officers, a windmill expert, and a Russian teacher. These speakers offer information and answer questions sent by network subscribers.

The Finished Product

Most projects on global networks conclude with a finished product, such as a report, journal, or newsletter, which serves as a summary and meaningful review of the project. Preparing the publication requires students to compile the messages sent during the term of the project and to edit them into a concise report. Through the editing process, students learn to differentiate facts from opinions and to recognize any bias in the messages. This is truly a cooperative endeavor, since each classroom in the learning cluster is responsible for a part of the project and publication. The completed publications then are transmitted on the network to be read by other subscribers.

Global network subscribers have access to many publishing outlets. WorldClassroom publishes *Newslink*, an international newspaper for all subscribers, which gives students the opportunity to publish for an international audience. Articles from recent issues include local news, student editorials, fables, and poems. On the AT&T Learning Network, each curriculum area publishes its own journal. Students can publish in *Mind Works: The Creative Writing Journal*, *Computer Chronicles Newspaper*, *Places and Perspectives Review*, *The Energy and Environment Newsletter*, *Society's Problems: A Social Science Journal*, or *Global Issues Review*. Often the finished product finds an audience beyond the network. Students' works have been published in professional journals and newsletters or distributed at professional conferences.

Most teachers involved with telecommunication believe that global networks provide a forum for exciting, innovative, and essential teaching as well as help to develop lasting friendships. Using global networks today helps prepare students and teachers for tomorrow's technology. By using global networks, students become involved with projects that take them beyond the classroom and into contact with the rest of the world. Interactions among project participants often continue after the project is completed. Over time, students and teachers who subscribe to global networks form a circle of friends from around the world. Even when no longer involved in a project, students and teachers on the same global network still can exchange messages. Their project may end, but the network of friends continues.

Of all the stated benefits of global networks, perhaps the most significant is the cooperation involved in the learning groups' projects, which demonstrates to teachers and students that people from different cultures and diverse perspectives can work together toward a common goal.

Future Perspectives

Today's computer and telecommunication technologies already have demonstrated their potential for teaching and learning and for making this planet a "global village." There is every reason to expect that the role these technologies will play in the 21st century will be even more important. The increasing power, along with the decreasing price, of technology and telecommunication will permit more and more people to interact on a global scale. By the beginning of the 21st century, it is estimated that 50% of the homes in the United States will have a personal computer; and half of those will be connected to a global network.

Clearly, people who are not technologically literate will be at a disadvantage in tomorrow's world. They will not have the technological skills needed for economic success and will not have access to information needed for cross-cultural understanding. But by using global networks, people in all countries will be able to access current information, make decisions, and solve problems from a global perspective. These skills are needed not only by the elite in business, science, or politics; they are needed by all.

A major pedagogical challenge facing educators is to anticipate changes in society worldwide and to adapt the curriculum to address these changes. Although predicting the future is always precarious, educators can develop long-range plans based on current trends. Fol-

lowing is an overview of what may occur as computer technologies and global networks interact with the school curriculum to prepare present and future students for their world.

Increasing Availability of Information

With each passing year, more people will have access to more information than ever before. Telephone companies will continue to install fiber optic cables, and computer scientists will develop data compression techniques that will allow more information to be readily available and to be transmitted at faster speeds. Modems will become obsolete as fiber optic lines and other telecommunication media will transmit the digital signals of the computer. Cities, states, countries, museums, and libraries will have computer-based information centers. By accessing these databases, people will have access to knowledge on almost any topic. The information will include data in print, audio, and video formats from around the globe.

An example of a future computer information center might be the database of the Smithsonian Institution, containing digitized information about each exhibit in the various Smithsonian museums. The exhibit information may be in text, pictures, audio, and video formats. If students in Sidney, Australia, decide to visit the Smithsonian, instead of flying to Washington, D.C., they will link their computer to the institution's computer information center. A menu will guide them through the different records, enabling them to view the desired exhibits. The students also will be able to save and print the information.

Even people who travel to Washington, D.C., and visit the Smithsonian will benefit from the database. The Smithsonian Institution, like most museums, does not have space for displaying all its exhibits; many are in storage. Visitors could access terminals located in the galleries and view exhibits not currently on display. Future monitors will present realistic, three-dimensional images that will rival viewing the actual exhibit. With computer functions, such as magnifica-

tion and accelerated cross-referencing of exhibits, many students might prefer a computer tour of the Smithsonian to a personal visit.

Computer-based data centers will be located throughout the world. Major libraries will provide computer access to the full text of their books and professional journals, and newspapers and magazines will be available online. Classrooms, as part of their global education, will communicate with databases sponsored by different countries containing information about each country's history, people, cities, government, land, economy, and other topics. As with the Smithsonian database, information from other national databases will be presented in print, audio, and video formats. The vast amount of information available on future global networks will cause Internet to be considered paltry instead of the "network of networks." Teachers and students who subscribe to a global network will be able to access information from anywhere.

Currently, many people use portable computers that connect to any phone line for transmitting and receiving data. These portable computers are often called "notebooks," a term that is indeed prophetic. In the future, instead of carrying spiral notebooks, students will use notebook computers for their homework, class notes, and other assignments. In addition to a phone line connection for transmitting and receiving, the portable computer will include a built-in cellular phone for telecommunication. Wherever subscribers of global networks are located, they will only have to press the dial function key on their notebook computer to be connected.

Global Computer-Based Applications

Advances in computer-based telecommunication will provide students with an increasing number of global learning opportunities. In a previously mentioned project, students in Florida schools exchanged messages with explorers at the South Pole. Future communication will involve more than just exchanging messages. The students will become part of the expedition, because the explorers will be able to

transmit audio and video accounts of their journey. In this project the interactive communication will be intensified, since the students will have the ability to transmit questions and suggestions as the study is taking place. Thus the students will become part of the research.

Organizations will sponsor many types of interactive investigations involving travels and tours using global networks. The National Geographic Society could sponsor a climb to the top of Mount Everest with the climbers equipped with miniature cameras, microphones, transmitters, and receivers for sending and receiving data on the network. Students could communicate with the climbers and experience the sights and sounds of the ascent. The climbers could transmit data collected during the trip to the students for analysis.

An example of a tour on a future global network is an excursion to Shanghai, China. The tour guide would transmit via the network the sounds and sights of the Art and History Museum, the Bund, the Jade Buddha Temple, the Mandarin's Garden, and other places of interest. Students could ask the guide questions and receive immediate answers during the tour. If a place of interest is omitted from the itinerary, students could request a tour of that sight. Chinese students from Shanghai could be part of the tour, so students would be able to interact with their peers.

Networks of classrooms located in different countries will be widespread. Classrooms subscribing to a global network will include video cameras, monitors, and microphones. By using microwave, computer, fiber optic, satellite, and other technologies, schools anywhere in the world can be linked together. All sites can see and hear the other locations, and any student can signal to become part of the discussion. The teacher conducting the class just touches a switch to activate the camera and microphone, and the student is ready to join the discussion. In this way, students do more than send messages, they become part of the learning environment in a distant location.

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Conclusion

An editorial in the *New York Times* (26 December 1990) noted that U.S. students score poorly on international achievement tests, and their performance worsens as they grow older. Among the 16 industrialized nations, American fifth-graders ranked eighth in science achievement; but by the ninth grade, they ranked 15th. Between 1970 and 1989, the number of Americans receiving doctorates declined about 7%, while the number of foreign students receiving doctorates from U.S. universities almost doubled.

Of the several remedies suggested in the editorial to reverse these trends, one was to use global networks. It was noted that projects that exploit modern technology and have real-world relevance tend to be more successful. Few would argue that changes currently occurring in society will require all citizens to be technologically literate and globally aware. Those who are not will be as disadvantaged as people who cannot read and write.

With the growth of telecommunication, interrelationships among the world's peoples are changing. The computer-based technologies that are helping to create the "global village" also are being used by educators to create global classrooms, in which students use global networks to acquire the knowledge and develop the skills needed to understand, influence, and guide their world. Global networks enable students at all grade levels to communicate with peers from around the globe. Through these networks, students are developing research

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skills by working with peers on projects of global significance and gaining knowledge of and insight into the world in which they live.

By becoming informed about global curricula, global education teaching strategies, and use of technology, teachers will be able to infuse global perspectives into the classroom. This includes instilling in students a respect for other cultures, a responsibility for their planet's environment, an international outlook, and the ability to work with people who hold different beliefs. These goals constitute the most important challenge facing educators in the 21st century. If they succeed in accomplishing these goals, they will have fulfilled an important mission.

Resources

The following list contains the names, addresses, and phone numbers of global education resources mentioned in this fastback:

Association for Supervision and Curriculum Development
125 N. West Street
Alexandria, VA 22314
(703) 549-9110

AT&T Learning Network
P.O. Box 6391
Parsippany, NJ 07054
(800) 367-7225

CompuServe Information Service
5000 Arlington Center Blvd.
P.O. Box 20212
Columbus, OH 43220
(800) 848-8990

Department of Education Programs
Superintendent of Documents
Government Printing Office
Washington, DC 20402
(202) 783-3238

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FrEdMail Foundation
Box 243
Bonita, CA 91908
(619) 475-4852

Global Common Classroom
Program in Social Ecology
University of California, Irvine
Irvine, CA 92717
(714) 856-6281

Global Laboratory
TERC Communications
2067 Massachusetts Avenue
Cambridge, MA 02140
(617) 547-0430

Global Studies Year-Round Magnet School
1215 Westover Terrace
Greensboro, NC 27408
(910) 370-8228

Internet Society
1895 Preston White Drive, Suite 100
Reston, VA 22091
(703) 648-9888

Kids Network
National Geographic Society
17th & M Streets, N.W.
Washington, DC 20036
(800) 368-2728

Prodigy Interactive Personal Service
445 Hamilton Avenue
White Plains, NY 10601
(800) 284-5933

Short Story International
P.O. Box 405
Great Neck, NY 11022
(516) 466-4166

Teleclass International
1103 9th Avenue
Honolulu, HI 96816
(808) 733-2007

WorldClassroom
Global Learning Corporation
P.O. Box 201361
Arlington, TX 76006
(800) 866-4452

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